

## Meat Safety News Digest

A collection of recent news relevant to the safety of red meat prepared by the Food Safety Program of Meat & Livestock Australia, for SAFEMEAT Stakeholders

### MICROBIAL SHEDDING

#### Effect of combinations of yeast culture and monensin in finishing diets on faecal shedding of *E. coli* O157:H7

US beef steers were used to evaluate the effects of dietary supplement on faecal shedding of *E. coli* O157:H7. Steers were fed diets with or without yeast culture or monensin (an antibiotic) and their combination.

Environmental samples (from each pen floor, feed bunk, and water trough) were collected on day-0 for a baseline and then faecal samples were collected over 125 days.

Samples were analysed for *E. coli* O157:H7, which were confirmed by a multiplex PCR (Polymerase Chain Reaction) assay. On day-0, *E. coli* O157:H7 was detected in 7.0% of feed stall samples and 14.3% of pen floor samples but in none of the water trough samples. The prevalence of *E. coli* O157:H7 in faecal samples decreased over time and in cattle fed yeast culture and yeast culture/monensin, faecal shedding was not detected by day-28. Results from this study indicate that feeding yeast cultures to cattle may numerically decrease but not eliminate faecal shedding of *E. coli* O157:H7 at the start of the dietary treatment and certain *E. coli* O157:H7 subtypes may persist in cattle fed dietary

supplements. <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000006/art00007>

#### Distiller's grain may increase *E. coli* in cattle

A four year study by the USDA Agriculture Research Service (ARS) indicated that *E. coli* O157:H7 in cattle manure, and on cattle hides, may be more prevalent for cattle whose corn-based feed contains wet distiller's grains with solubles (WDGS), the by-product of corn processed to make ethanol. They found that in the 608 steers they studied the incidence and prevalence of *E. coli* O157:H7 in manure, and the incidence on hides, was higher for cattle whose corn-based feed included 40% WDGS than those whose feed did not include WDGS. This work adds to already published data and in follow-up studies the researchers want to determine what causes the difference in *E. coli* levels, and what can be done to reduce levels.

[http://www.foodsafetynews.com/2011/05/distillers-grain-may-increase-e-coli-in-cattle/?utm\\_source=feedburner&utm\\_medium=feed&utm\\_campaign=Feed%3A+foodsafetynews%2FmRcs+%28Food+Safety+News%29](http://www.foodsafetynews.com/2011/05/distillers-grain-may-increase-e-coli-in-cattle/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+foodsafetynews%2FmRcs+%28Food+Safety+News%29)

#### Vaccination to decrease shedding in calves after infection with *E. coli* O157

The aim of this Canadian study was to test the effectiveness of a commercially produced vaccine to a specific *E. coli* O157 protein (type III secreted protein (TTSP)). Blood analysis showed a good immune response to the vaccination, i.e. the blood serum antibodies concentration was higher in

vaccinates than in the placebo-treated animals. The results indicated decreased *E. coli* O157 shedding in vaccinated animals than in the placebo-treated animals on days-3 to -6, the peak shedding time. These data indicate that TTSP vaccination was effective in reducing the number of animals that are shedding and the number of *E. coli* O157 shed per animal. The study provides evidence that TTSP vaccination could be an effective pre-harvest intervention strategy against *E. coli* O157. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3062931/>

### **Faecal carriage and shedding density of *E. coli* in cattle, chickens and pigs**

UK researchers determined the number and proportion of CTX-M beta-lactamase-producing *E. coli* (bacteria that produce an enzyme that can breakdown penicillin-like antibiotics) in faeces from cattle, chickens and pigs to provide a better understanding of the risk of transfer of these types of bacteria to humans from food animal sources. Samples of bovine and swine faeces were collected from farms and chicken caecal contents from abattoirs. They found large variation in the number of CTX-M-positive *E. coli* detected for cattle, chickens and pigs. The percentage of *E. coli* isolates that were CTX-M-positive also varied widely. They found the proportion of high density shedders of CTX-M *E. coli* animals was highest in chickens, then pigs and lowest in cattle. The researchers postulated that high levels of CTX-M *E. coli* in faeces could increase the possibility of transferring the genes.

<http://aem.asm.org/cgi/content/abstract/AEM.02831-10v1?etoc>

## **DIRECT FED MICROBIALS**

### **Review: The use of direct fed microbials to mitigate pathogens and enhance production in cattle**

Canadian researchers reviewed the current emphasis on the development of direct fed microbials (DFMs) that exhibit activity in cattle against potential pathogens such as *E. coli* O157:H7, *Salmonella* spp. and *Staphylococcus aureus*. DFMs are a feed supplement composed of living microorganisms, like probiotics. This review covers the challenges for development of DFMs that are effective over a wide range of ruminant production systems. Only a few studies they cited have employed molecular techniques to study in detail the interaction of DFMs with native microbial communities in the host ruminant gut. The researchers surmise that advancements in next generation sequencing of microbial communities and the genomics of microbial–host interactions may enable DFMs to be specifically formulated to improve production and promote health, that are presently achieved through the use of antimicrobials.

<http://pubs.aic.ca/doi/full/10.4141/CJAS10047>

## **COOKED MEAT CHILLER TREATMENT**

### **Application of heat in post-cooked meat chillers to reduce *Listeria***

Australian researcher's trialled electrical air-blowing heaters to heat and dry-out holding chillers used for post-cooked processed meats in an attempt to control the presence of *Listeria*. A baseline study of the prevalence of *Listeria* in holding chillers in seven facilities was undertaken. *Listeria* was detected in four of the seven chillers; two of the facilities with established *Listeria* contamination were chosen for further studies. The heating trials consisted of three different time/temperature interventions at each of the

two facilities; swab samples were taken for two weeks after the treatments. The results were different for each facility; treatment at 37°C for 36 hours reduced prevalence in the first chiller. Treatment at 50°C for 2 hours reduced prevalence in the second chiller. The incorporation of these two chiller heating protocols into these facilities' good manufacturing practices would reduced prevalence of

*Listeria*. <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000006/art00020>

## VACUUM-PACKED BEEF SPOILAGE

### Involvement of *Clostridium gasigenes* and *C. algidicarnis* in blown pack spoilage of beef

The objectives of this Brazilian study were to isolate psychrotrophic (cold-growing) clostridia from vacuum-packed beef cuts and to identify the isolates by using DNA sequencing and biochemical tests. Anaerobic psychrotrophic microorganisms were also counted and samples were collected from areas around the abattoir for comparison. *Clostridium gasigenes* and *C. algidicarnis* were identified using DNA sequencing and were found in high numbers in blown packs but also in non-blown packs and the abattoir environment. The isolates were shown to grow between 6.2 and 8.2°C, hence, exhibiting psychrotrophic behaviour. This study showed that psychrotrophic *Clostridium* may pose a risk in tropical countries to the shelf-life of vacuum-packed beef and highlights the need of adopting control measures to reduce their incidence in the abattoir environment to prevent blown pack spoilage. <http://www.sciencedirect.com/science/article/pii/S0168160511002996>

## SAMPLING PLANS

### Assumptions of acceptance sampling and the implications for contamination: *E. coli* O157 in beef

The aims of this Australian work were to determine the distribution and concentration of *E. coli* O157 in lots of beef destined for grinding that failed to meet requirements for export, to use these data to better understand the performance of sampling plans, and to consider alternative approaches for evaluating sampling plans. For each of the lots from which *E. coli* O157 had been detected, samples from the external carcass surface were tested. *E. coli* O157 was detected in two of the five lots tested and the number of cells estimated. The results highlighted the use of the current sampling plans, based on a binomial distribution, can provide an overly confident view that it is a failsafe control measure when applied to assessment of *E. coli* O157 contamination in beef. Alternative approaches to understanding sampling plans, which do not assume homogeneous contamination throughout the lot, would be more accurate. These results indicated that despite the application of stringent sampling plans, sampling and testing approaches may be inefficient for controlling microbiological quality. <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000004/art00004>

## PREDICTIVE MICROBIOLOGY

### Models of *Pseudomonas* growth kinetics and shelf-life in chilled beef

The aim of this Chinese study was to determine if *Pseudomonas* spp. were the specific spoilage organisms of chilled beef during aerobic storage and to establish a

model to predict the shelf-life of beef. Naturally contaminated beef was stored at 4°C, and the number of *Pseudomonas* organisms, total number of bacteria, total volatile basic nitrogen (TVBN) values were measured as quality/spoilage indicators over time. The beef was then stored at 0 to 20°C for varying amounts of time, and the number of *Pseudomonas* organisms were counted. The results showed that the presence of *Pseudomonas* spp. was correlated with each quality characteristic, demonstrating that *Pseudomonas* spp. were the main spoilage organism in this study. The model presented describes the influence of different temperatures on the growth of *Pseudomonas* spp., thereby establishing a model for the prediction of the shelf life of beef stored between 0 to 20°C.

<http://www.ajas.info/Editor/manuscript/upload/24-83.pdf>

## ABATTOIR FOOD SAFETY ASSESSMENT

### **Review: The effect of HACCP on microbial contamination of carcasses in abattoirs**

Hazard analysis critical control point (HACCP) programs have been endorsed and implemented globally to enhance food safety. The objective of these Canadian researchers was to identify, assess, and summarize the published research investigating the effect of HACCP programs on microbial prevalence and concentration on food animal carcasses in abattoirs through primary processing. They excluded a combined analysis of all results because of a lack of individual studies and heterogeneity across the published studies. Australia has reported extensive national data from four years prior to HACCP implementation to four years post-HACCP, indicating reduction in microbial prevalence and concentration on beef carcasses in abattoirs slaughtering beef for export; however, the effect of abattoir changes initiated independent of HACCP could not be determined. The researchers concluded more primary research and access to relevant proprietary data are needed to properly evaluate HACCP program effectiveness using modelling techniques. <http://www.liebertonline.com/doi/abs/10.1089/fpd.2010.0809>

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